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November 2, 2007

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Name of applicant, assignee or Registered Representative

Signature

November 2, 2007

Date of Signature

Our Case No. 11336/433 (P03059US)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)
Allan O. Devantier et al.	)
Serial No. 10/684,222	) Examiner: Paul, Disler
Filing Date: October 10, 2003	) Group Art Unit No.: 2615
For STATISTICAL ANALYSIS OF POTENTIAL AUDIO SYSTEM CONFIGURATIONS	) Confirmation No.: 8660

RESPONSE TO NON-FINAL OFFICE ACTION DATED MAY 2, 2007

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Applicants file the enclosed response to the Office Action dated May 2, 2007 as follows:

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Claims are reflected in the listing of the claims that begin on page 3 of this paper.

Remarks begin on page 25 of this paper.

Amendments to the Specification:

Please replace paragraph [001] with the following amended paragraph:

[001] This application claims priority to U.S. Provisional Application Serial No. 60/492,688 entitled "In-Room Low Frequency Optimization" filed on August 4, 2003, and is incorporated by reference in its entirety. This application claims priority to U.S. Provisional Application Serial No. [[______]] 60/509,799 entitled "In-Room Low Frequency Optimization," Attorney Reference Number 11336/643 P03059USV1, filed on October 9, 2003, and is incorporated by reference in its entirety.

Please replace paragraph [003] with the following amended paragraph:

[003] U.S. Patent Application Serial Number [[__________]]10/684,152, entitled "Statistical Analysis of Potential Audio System Configurations," Attorney Reference Number 11336/434 P03060US, filed on October 10, 2003, and now U.S. Patent Number __________.

Please replace paragraph [004] with the following amended paragraph:

[004] U.S. Patent Application Serial Number [[__________]]10/684,043, entitled "System for Selecting Speaker Locations in an Audio System," Attorney Reference Number 11336/435 P03061US, filed on October 10, 2003, and now U.S. Patent Number __________.

Please replace paragraph [005] with the following amended paragraph:

[005] U.S. Patent Application Serial Number [[__________]]10/684,208, entitled "System for Configuring Audio System," Attorney Reference Number 11336/545 P03121US, filed on October 10, 2003, and now U.S. Patent Number __________.

Listing of the Claims:

The listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) An audio system comprising a configuration, the correction selected based on a ~~A method for selecting a configuration for an audio system, the~~ method comprising:

generating acoustic signals from at least one loudspeaker placed at potential loudspeaker locations;

recording transfer functions for the generated acoustic signals at a plurality of listening positions;

determining potential configurations of the audio system;

modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions at each of the plurality of listening positions;

statistically analyzing across at least one frequency of the predicted transfer functions for the plurality of listening positions; and

selecting a configuration based on the statistical analysis.

2. (Currently Amended) The ~~method~~ audio system of claim 1, where the configuration comprises at least one parameter that affects acoustical performance of the audio system;

where determining potential configurations comprises determining potential values for the parameter;

where modifying the transfer functions comprises modifying the transfer functions based on the potential values for the parameter; and

where selecting a configuration comprises selecting a value for the parameter.

3. (Currently Amended) The ~~method~~ audio system of claim 2, where determining potential values for the parameter comprises inputting potential values for the parameter.

4. (Currently Amended) The ~~method~~ audio system of claim 2, where the configuration comprises at least two parameters that affect acoustical performance of the audio system; and

where determining potential configurations of the audio system comprises determining potential combinations of potential values of the parameters.

5. (Currently Amended) The ~~method~~ audio system of claim 2, where the parameter is selected from the group consisting of positions of the loudspeakers, number of loudspeakers, types of loudspeakers, and correction factors.

6. (Currently Amended) The ~~method~~ audio system of claim 2, where the parameter comprises positions of the loudspeakers; and

where determining potential configurations comprises:

determining potential positions of the loudspeakers; and

generating potential combinations of speakers based on the potential positions of the loudspeakers; and

where modifying the transfer functions comprises superpositioning of the transfer functions based on the potential combinations of speakers.

7. (Currently Amended) The ~~method~~ audio system of claim 6, where the at least one parameter further comprises correction factors; and

where the potential configurations are based on the potential combinations of speakers and the potential values for the correction factors.

8. (Currently Amended) The ~~method~~ audio system of claim 1, where recording transfer functions at a plurality of listening positions comprises placing a microphone at each of the listening positions and recording the transfer functions.

9. (Currently Amended) The ~~method~~ audio system of claim 1, where the statistical analysis is across a plurality of frequencies of the predicted transfer functions.

10. (Currently Amended) The ~~method~~ audio system of claim 9, where the plurality of frequencies are less than 120 Hz.

11. (Currently Amended) The ~~method~~ audio system of claim 1, where the statistical analysis is selected from the group consisting of mean spatial variance, mean spatial standard deviation, mean spatial envelope, and mean spatial maximum average.

12. (Currently Amended) The ~~method~~ audio system of claim 1, where the statistical analysis comprises mean spatial variance.

13. (Currently Amended) The ~~method~~ audio system of claim 12, where the mean spatial variance is based on an average of spatial variance across the listening positions for a plurality of frequencies.

14. (Currently Amended) The ~~method~~ audio system of claim 1, where selecting a configuration comprises automatically recommending a plurality of potential configurations and manually selecting one of the plurality of potential configurations.

15. (Currently Amended) A machine readable medium having software for causing a machine to execute a method, the machine readable medium comprising:

instructions for generating acoustic signals from at least one loudspeaker placed at potential loudspeaker locations;

instructions for recording transfer functions for the generated acoustic signals at a plurality of listening positions;

instructions for determining potential configurations of the audio system;

instructions for modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions at each of the plurality of listening positions;

instructions for statistically analyzing across at least one frequency of the predicted transfer functions for the plurality of listening positions.

16. (Original) The machine readable medium of claim 15, where the instructions for recording transfer functions comprise instructions for storing the transfer functions in a memory.

17. (Original) The machine readable medium of claim 15, where the instructions for determining potential configurations comprise instructions for inputting potential values for at least one parameter for the audio system.

18. (Original) The machine readable medium of claim 17, where the audio system comprises at least two parameters that affect acoustical performance; and

where the instructions for determining potential configurations of the audio system comprise instructions for determining potential combinations of potential values of the parameters.

19. (Original) The machine readable medium of claim 15, where the statistical analysis is across a plurality of frequencies of the predicted transfer functions.

20. (Original) The machine readable medium of claim 19, where the plurality of frequencies are less than 120 Hz.

21. (Original) The machine readable medium of claim 15, where the statistical analysis is selected from the group consisting of mean spatial variance, mean spatial standard deviation, mean spatial envelope, and mean spatial maximum average.

22. (Original) The machine readable medium of claim 15, where the statistical analysis comprises mean spatial variance.

23. (Original) The machine readable medium of claim 22, where the mean spatial variance is based on an average of spatial variance across the listening positions for a plurality of frequencies.

24. (Original) The machine readable medium of claim 15, further comprising instructions for recommending a plurality of potential configurations.

25. (Currently Amended) A computer system for analyzing potential configurations in an audio system, the computer system comprising:

a memory storing transfer functions recorded at a plurality of listening positions in the audio system; and

a processor in communication with the memory, the processor determining potential configurations of the audio system, modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions at each of the plurality of listening positions, statistically analyzing across at least one frequency of the predicted transfer functions, and recommending at least one of the potential configurations based on the statistical analysis.

26. (Original) The computer system of claim 25, where the statistical analysis comprises mean spatial variance.

27. (Currently Amended) Method for selecting a configuration for an audio system, the method comprising:

recording transfer functions at ~~at least one~~ a plurality of listening positions in the audio system;

determining potential configurations of the audio system;

modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions at at least two of the plurality of listening positions;

statistically analyzing the predicted transfer functions at the at least two of the plurality of listening positions; and

selecting a configuration based on the statistical analysis.

28. (Currently Amended) The method of claim 27, where the configuration comprises at least one parameter that affects acoustical performance of the audio system;

where determining potential configurations comprises determining potential values for the parameter;

where modifying the transfer functions comprises modifying the transfer functions based on the potential values for the parameter; and

where selecting a configuration comprises selecting a value for the parameter in order to optimize the at least one criterion across the at least two of the plurality of listening positions.

29. (Original) The method of claim 28, where the parameter is selected from the group consisting of positions of the loudspeakers, number of loudspeakers, types of loudspeakers, and correction factors.

30. (Original) The method of claim 27, where the transfer functions measure at least one acoustical property of the audio system.

31. (Original) The method of claim 30, where the transfer function measures amplitude and phase at a single frequency or multiple frequencies.

32. (Original) The method of claim 27, where the loudspeaker is a subwoofer.

33. (Original) The method of claim 27, where the audio system comprises a plurality of loudspeakers.

34. (Currently Amended) The method of claim 27, where the configuration comprises potential loudspeaker locations; [[and]]

where recording transfer functions comprises generating acoustic signals from the loudspeaker placed at each of the potential loudspeaker locations; and recording the transfer functions for the plurality of listening positions for the generated acoustic signals; and

where selecting a configuration based on the statistical analysis comprises selecting less than all of the potential loudspeaker locations for placement of loudspeakers in the audio system.

35. (Original) The method of claim 34, where generating acoustic signals from the loudspeaker placed at each of the potential loudspeaker locations comprises placing the loudspeaker at a first potential position and controlling the audio system to generate an acoustic signal; and

where recording transfer functions at the plurality of listening positions comprises placing a microphone at a first listening position and recording the acoustic signal and placing the microphone at a second listening position and recording the acoustic signal.

36. (Canceled)

37. (Original) The method of claim 28, where determining potential values for the parameter comprises selecting a discrete number of potential configurations.

38. (Original) The method of claim 28, where determining potential values for the parameter comprises selecting a range of potential values.

39. (Original) The method of claim 28, where the parameter comprises loudspeaker locations;

where recording transfer functions comprises recording transfer functions at the listening positions with the loudspeaker in each of the plurality of potential loudspeaker locations;

where determining potential configurations comprises inputting a plurality of potential loudspeaker locations and determining potential combinations of the potential loudspeaker locations; and

where modifying the transfer functions comprises combining the transfer functions for the listening positions for each of the potential combinations of loudspeaker locations to generate the predicted transfer functions.

40. (Original) The method of claim 39, where the plurality of loudspeaker locations comprises a first potential loudspeaker location and a second potential loudspeaker location;

where recording transfer functions comprises:

recording a first transfer function at a first listening position with the loudspeaker at the first potential loudspeaker location;

recording a second transfer function at the first listening position with the loudspeaker at the second potential loudspeaker location;

recording a third transfer function at a second listening position with the loudspeaker at the first potential loudspeaker location; and

recording a fourth transfer function at the second listening position with the loudspeaker at the second potential loudspeaker location;

where combining the transfer functions comprises:

combining the first transfer function and the second transfer function; and

combining the third transfer function and the fourth transfer function;

where statistically analyzing the predicted transfer functions is based on the first transfer function, the second transfer function, the third transfer function, the fourth transfer function, the combined first and second transfer function and the combined third and fourth transfer function.

41. (Original) The method of claim 40, where combining the first transfer function and the second transfer function comprises performing superposition of the first transfer function with the second transfer function; and

where combining the third transfer function and the fourth transfer function comprises performing superposition of the third transfer function with the fourth transfer function

42. (Currently Amended) The method of claim 27, where the configuration comprises number of loudspeakers;

where potential configurations comprise potential numbers of loudspeakers; [[and]]

where modifying the transfer functions based on the potential configurations comprises:

determining potential combinations of loudspeakers at potential loudspeaker locations, the potential combinations being equal to at least one of the potential number of loudspeakers; and

combining the transfer functions for each of the potential combinations to generate predicted transfer functions for each of the potential combinations, and

where selecting one of the potential numbers of speakers based on the statistical analysis comprises.

43. (Currently Amended) The method of claim 28, where the parameter comprises types of loudspeakers;

where determining potential configurations comprises determining combinations of potential types of loudspeakers at potential loudspeaker locations;

where recording transfer functions comprises recording transfer functions at the listening positions with each potential type of loudspeaker in each of the plurality of potential loudspeaker locations; and

where modifying the transfer functions based on the potential configurations comprises combining the transfer functions for the listening positions for each of the combinations to generate predicted transfer functions.

44. (Original) The method of claim 43, where the types of loudspeakers comprises loudspeakers with different qualities.

45. (Original) The method of claim 44, where the potential types of loudspeakers comprise a dipole loudspeaker and a monopole loudspeaker.

46. (Original) The method of claim 27, where the configuration comprises correction factors;

where potential configurations comprise potential values for the correction factors; and

where modifying the transfer functions based on the potential configurations comprises modifying the transfer functions for potential values for the correction factors to generate predicted transfer functions for each of the potential values.

47. (Original) The method of claim 46, where the correction factors comprise gain, delay, and equalization.

48. (Currently Amended) The method of claim 27, where the configuration comprises a plurality of parameters;

where determining potential configurations comprises determining potential values for the plurality of parameters and determining potential combinations of the potential values of the parameters;

where recording transfer functions comprises recording transfer functions at the listening positions with each type of potential loudspeaker in each of a plurality of potential loudspeaker locations; and

where modifying the transfer functions based on the potential configurations comprises modifying the transfer functions based on the potential combinations to generate predicted transfer functions.

49. (Original) The method of claim 27, where statistically analyzing the predicted transfer functions comprises analyzing frequencies of the predicted transfer functions below about 120 Hz.

50. (Currently Amended) The method of claim 27, ~~where recording the transfer functions comprises recording the transfer functions at a plurality of listening positions; and~~

where statistically analyzing the predicted transfer functions comprises analyzing the predicted transfer functions across the plurality of listening positions.

51. (Original) The method of claim 50, where analyzing the predicted transfer functions across the plurality of listening positions is a function of frequency.

52. (Currently Amended) The method of claim 27, ~~where recording the transfer functions comprises recording the transfer functions at a plurality of listening positions; and~~

where statistically analyzing the predicted transfer functions comprises analyzing the predicted transfer functions for each of the plurality of listening positions.

53. (Currently Amended) The method of claim 27, ~~where recording the transfer functions comprises recording the transfer functions at a plurality of listening positions; and~~

where the statistical analysis indicates consistency of the predicted transfer functions across the plurality of listening positions.

54. (Currently Amended) Method for selecting a configuration for an audio system, the [[The]] method ~~of claim 27,~~ comprising:

recording transfer functions at at least one listening positions in the audio system;

determining potential configurations of the audio system;

modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions;

statistically analyzing the predicted transfer functions; and

selecting a configuration based on the statistical analysis,

where recording the transfer functions comprises recording the transfer functions at a plurality of listening positions; and

where the statistical analysis is selected from the group consisting of mean spatial variance, mean spatial standard deviation, mean spatial envelope, and mean spatial maximum average.

55. (Currently Amended) The method of claim 27, ~~where recording the transfer functions comprises recording the transfer functions at a plurality of listening positions; and~~

where the statistical analysis comprises mean spatial variance.

56. (Original) The method of claim 55, where the mean spatial variance is based on an average of spatial variance across the listening positions for a plurality of frequencies.

57. (Original) The method of claim 27, where the statistical analysis indicates flatness of the predicted transfer functions.

58. (Currently Amended) The method of claim 27, ~~where recording the transfer functions comprises recording the transfer functions at a plurality of listening positions; and~~

where the statistical analysis is selected from the group consisting of variance of spatial average, standard deviation of the spatial average, envelope of the spatial average, and variance of the spatial minimum.

59. (Original) The method of claim 27, where the statistical analysis is selected from the group consisting of amplitude variance and amplitude standard deviation.

60. (Currently Amended) The method of claim 27, ~~where recording the transfer functions comprises recording the transfer functions at a plurality of listening positions; and~~

where the statistical analysis indicates differences in overall sound pressure level among the plurality of listening positions for the predicted transfer functions.

61. (Currently Amended) The method of claim 27, ~~where recording the transfer functions comprises recording the transfer functions at a plurality of listening positions; and~~

where the statistical analysis is selected from the group consisting of variance of mean levels; standard deviation of mean levels, envelope of mean levels, and maximum average of mean levels.

62. (Currently Amended) <u>Method for selecting a configuration for an audio system, the</u> [[The]] method ~~of claim 27,~~ <u>comprising:</u>

<u>recording transfer functions at at least one listening positions in the audio system;</u>

<u>determining potential configurations of the audio system;</u>

<u>modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions;</u>

<u>statistically analyzing the predicted transfer functions; and</u>

<u>selecting a configuration based on the statistical analysis,</u>

where recording the transfer functions comprises recording the transfer functions at a plurality of listening positions; and

where the statistical analysis indicates efficiency of the predicted transfer functions at the plurality of listening positions.

63. (Original) The method of claim 62, where efficiency is examined for predetermined frequencies.

64. (Original) The method of claim 63, where selecting a configuration based on the statistical analysis comprises selecting a value for a parameter to increase efficiency of the audio system in the predetermined frequencies.

65. (Original) The method of claim 64, where the parameter comprises volume correction; and

where selecting a value to increase efficiency comprises selecting a value that decreases the volume of at least one of the loudspeakers in the audio system.

66. (Original) The method of claim 27, where the statistical analysis comprises acoustic efficiency.

67. (Original) The method of claim 66, where the acoustic efficiency comprises a mean overall level divided by a total drive level for the predicted transfer function.

68. (Original) The method of claim 66, where selecting a configuration based on the statistical analysis comprises selecting a value for a parameter to increase acoustic efficiency of the audio system.

69. (Original) The method of claim 68, where the parameter comprises volume correction; and

where selecting a value to increase acoustic efficiency comprises selecting a value that decreases the volume of at least one of the loudspeakers in the audio system.

70. (Currently Amended) The method of claim 27, ~~where recording the transfer functions comprises recording the transfer functions at a plurality of listening positions; and~~

where the statistical analysis indicates output of predicted transfer functions at the multiple listening positions.

71. (Original) The method of claim 70, where output is examined for predetermined frequencies.

72. (Original) The method of claim 71, where selecting a configuration based on the statistical analysis comprises selecting a value for a parameter to increase output of the audio system in the predetermined frequencies.

73. (Original) The method of claim 72, where the parameter comprises volume correction; and

where selecting a value to increase output comprises selecting a value that decreases the volume of at least one of the loudspeakers in the audio system.

74. (Currently Amended) The method of claim 27, ~~where recording the transfer functions comprises recording the transfer functions at a plurality of listening positions; and~~

where the statistical analysis comprises mean overall level.

75. (Original) The method of claim 27, where selecting a configuration comprises selecting one of the potential values of the parameter.

76. (Original) The method of claim 27, where selecting a configuration comprises manually selecting a configuration.

77. (Original) The method of claim 27, where selecting a configuration comprises automatically selecting a configuration.

78. (Original) The method of claim 77, where a plurality of statistical analyses are performed; and

where selecting a configuration is based on weighting the plurality of statistical analyses.

79. (Original) The method of claim 27, where the statistical analysis ranks the predicted transfer functions based on at least one metric, and

where selecting a configuration comprises selecting a configuration based on the ranking.

80. (Original) The method of claim 79, where selecting a configuration based on the ranking comprises selecting an optimal value based on a highest ranked predicted transfer function.

81. (Currently Amended) A machine readable medium having software for causing a machine to execute a method, the machine readable medium comprising:

instructions for storing transfer functions recorded at ~~at least one~~ a plurality of listening positions in an audio system;

instructions for determining potential configurations for the audio system;

instructions for modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions at at least two of the plurality of listening positions; and

instructions for statistically analyzing the predicted transfer functions at the at least two of the plurality of listening positions.

82. (Original) The machine readable medium of claim 81, where the instructions for determining potential configurations comprise instructions for receiving input for potential values of parameters for the audio system.

83. (Currently Amended) The machine readable medium of claim 81, where the potential configurations comprise a plurality of potential loudspeaker locations;

where the transfer functions are recorded with the loudspeaker in each of the plurality of potential loudspeaker locations;

where the instructions for determining potential configurations for the audio system comprise instructions for determining potential combinations of the potential loudspeaker locations; and

where the instructions for modifying the transfer functions based on the potential configurations comprise instructions for combining the transfer functions for the listening positions for each of the potential combinations of loudspeaker locations to generate predicted transfer functions.

84. (Original) The machine readable medium of claim 81, where the potential configurations comprise potential values for the correction factors;

where the instructions for modifying the transfer functions based on the potential configurations comprise instructions for modifying the transfer functions for potential values for the correction factors to generate predicted transfer functions for each of the potential values.

85. (Original) The machine readable medium of claim 84, where the correction factors comprise gain, delay, and equalization.

86. (Currently Amended) The machine readable medium of claim 81, where the configuration comprises a plurality of parameters;

where the instructions for determining potential configurations comprise instructions for inputting potential values for the plurality of parameters and instructions for determining potential combinations of the potential values of the parameters;

where the instructions for recording transfer functions comprise instructions for recording transfer functions at each of [[a]] <u>the</u> plurality of listening positions with each type of potential loudspeaker in each of a plurality of potential loudspeaker locations; and

where the instructions for modifying the transfer functions based on the potential configurations comprise instructions for modifying the transfer functions based on the potential combinations to generate predicted transfer functions for the potential combinations.

87. (Original) The machine readable medium of claim 81, where the instructions for statistically analyzing the predicted transfer functions comprise instructions for analyzing frequencies of the predicted transfer functions below about 120 Hz.

88. (Currently Amended) The machine readable medium of claim 81, ~~where the instructions for recording the transfer functions comprise instructions for recording the transfer functions at a plurality of listening positions; and~~

where the instructions for statistically analyzing the predicted transfer functions comprise instructions for analyzing the predicted transfer functions across the plurality of listening positions.

89. (Original) The method of claim 88, where the instructions for analyzing the predicted transfer functions across the plurality of listening positions is as a function of frequency.

90. (Currently Amended) The machine readable medium of claim 81, ~~where the instructions for recording the transfer functions comprise instructions for recording the transfer functions at a plurality of listening positions; and~~

where the instructions for statistically analyzing the predicted transfer functions comprise instructions for analyzing the predicted transfer functions for each of the plurality of listening positions.

91. (Currently Amended) The machine readable medium of claim 81, ~~where the instructions for recording the transfer functions comprise instructions for recording the transfer functions at a plurality of listening positions; and~~

where the statistical analysis indicates flatness of the predicted transfer functions across the plurality of listening positions.

92. (Original) The machine readable medium of claim 81, where the statistical analysis is selected from the group consisting of mean spatial variance, mean spatial standard deviation, mean spatial envelope, and mean spatial maximum average

93. (Original) The machine readable medium of claim 81, where the statistical analysis comprises mean spatial variance.

94. (Original) The machine readable medium of claim 81, where the statistical analysis indicates how much equalization is necessary for the predicted transfer functions.

95. (Original) The machine readable medium of claim 81, where the statistical analysis is selected from the group consisting of variance of spatial average, standard deviation of the spatial average, envelope of the spatial average, and variance of the spatial minimum.

96. (Currently Amended) The machine readable medium of claim 81, ~~where the instructions for recording the transfer functions comprise instructions for recording the transfer functions at a plurality of listening positions; and~~

where the statistical analysis indicates differences in overall sound pressure level among the plurality of listening positions for the predicted transfer functions.

97. (Original) The machine readable medium of claim 81, where the statistical analysis is selected from the group consisting of variance of mean levels, standard deviation of mean levels, envelope of mean levels, and maximum average of mean levels.

98. (Currently Amended) The machine readable medium of claim 81, ~~where the instructions for recording the transfer functions comprise instructions for recording the transfer functions at a plurality of listening positions; and~~

where the statistical analysis indicates efficiency of the predicted transfer functions at the plurality of listening positions.

99. (Original) The machine readable medium of claim 81, where the statistical analysis comprises acoustic efficiency.

100. (Original) The machine readable medium of claim 81, where the statistical analysis comprises mean overall level.

101. (Original) The machine readable medium of claim 81, further comprising instructions for recommending at least one of the potential configurations.

102. (Original) The machine readable medium of claim 101, where a plurality of statistical analyses are performed; and

where the instructions for recommending at least one of the potential configurations is based on weighting the plurality of statistical analyses.

103. (Original) The machine readable medium of claim 101, where the instructions for the statistical analysis ranks the predicted transfer functions based on at least one metric, and

where the instructions for recommending a configuration comprise recommending a configuration based on ranking the at least one metric.

104. (Original) The machine readable medium of claim 103, where the instructions for recommending a configuration based on the ranking comprise instructions for recommending an optimal value based on a highest ranked predicted transfer function.

105. (Currently Amended) A signal-bearing medium having software for causing a machine to execute a method, the signal-bearing medium comprising:

logic for storing transfer functions recorded at ~~at least one~~ a plurality of listening positions in an audio system;

logic for determining potential configurations for the audio system;

logic for modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions at at least two of the plurality of listening positions; and

logic for statistically analyzing the predicted transfer functions at the at least two of the plurality of listening positions.

106. (Currently Amended) A computer-data signal embodied in a carrier wave, the computer-data signal comprising:

code segment for recording transfer functions at ~~at least one~~ a plurality of listening positions in an audio system;

code segment for determining potential configurations for the audio system;

code segment for modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions at at least two of the plurality of listening positions; and

code segment for statistically analyzing the predicted transfer functions at the at least two of the plurality of listening positions.

107. (Currently Amended) In an audio system comprising at least one loudspeaker and a plurality of listening positions, a system for analyzing potential configurations comprising:

means for storing transfer functions recorded at ~~at least one~~ a plurality of listening positions;

means for determining potential configurations for the audio system;

means for modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions at at least two of the plurality of listening positions; and

means for statistically analyzing the predicted transfer functions at the at least two of the plurality of listening positions.

108. (Original) The system of claim 107, where means for recording potential configurations for the audio system comprises means for recording parameters for the configurations, the parameters selected from the group consisting of positions of the loudspeakers, number of loudspeakers, types of loudspeakers, and correction factors.

109. (Currently Amended) The system of claim 107, ~~where means for storing transfer functions comprises means for storing transfer functions recorded at a plurality of listening positions; and~~

where means for statistically analyzing comprises means for analyzing the predicted transfer functions across the plurality of listening positions.

110. (Original) The system of claim 109, where means for statistically analyzing comprises means for calculating the mean spatial variance.

111. (Currently Amended) In an audio system comprising at least one loudspeaker and a plurality of listening positions, a system for analyzing potential configurations comprising:

storage means for storing transfer functions recorded at the plurality of listening positions; and

processor means for determining potential configurations for the audio system, for modifying the transfer functions based on the potential configurations in order to generate

predicted transfer functions at each of the plurality of listening positions, and for statistically analyzing the predicted transfer functions.

112. (Original) The system of claim 111, where the processor means further recommends at least one of the potential configurations based on the statistical analysis.

113. (Original) The system of claim 111, where the statistical analysis is across at least one frequency of the predicted transfer functions.

114. (Currently Amended) A computer system for analyzing potential configurations in an audio system comprising:

a memory storing transfer functions recorded at a plurality of listening positions in the audio system; and

a processor determining potential configurations for the audio system, modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions at each of the plurality of listening positions, and statistically analyzing the predicted transfer functions.

115. (Original) The computer system of claim 114, where the processor further recommends at least one of the potential configurations based on the statistical analysis.

116. (Original) The computer system of claim 114, where the statistical analysis is across at least one frequency of the predicted transfer functions.

117. (New) The audio system of claim 1, wherein statistically analyzing the predicted transfer functions at the plurality of listening positions comprises:

analyzing for a first configuration a first predicted transfer function at a first listening position and a second predicted transfer function at a second listening position for at least one criterion; and

analyzing for a second configuration a third predicted transfer function at the first listening position and a fourth predicted transfer function at the second listening position for the at least one criterion; and

wherein selecting a configuration based on the statistical analysis comprises selecting one of the first configuration or second configuration based on the analysis of the criterion for the first configuration and second configuration.

118. (New) The audio system of claim 117, wherein the criterion comprises flatness of the predicted transfer functions.

119. (New) The method of claim 27, wherein statistically analyzing the predicted transfer functions at the at least two of the plurality of listening positions comprises:

analyzing for a first configuration a first predicted transfer function at a first listening position and a second predicted transfer function at a second listening position for at least one criterion; and

analyzing for a second configuration a third predicted transfer function at the first listening position and a fourth predicted transfer function at the second listening position for the at least one criterion; and

wherein selecting a configuration based on the statistical analysis comprises selecting one of the first configuration or second configuration based on the analysis of the criterion for the first configuration and second configuration.

120. (New) The method of claim 119, wherein the criterion comprises flatness of the predicted transfer functions.

Remarks

1. Introduction

Claims 1-35, and 37-120 are pending.

2. Information Disclosure Statement

Applicants request confirmation that references A29-A33 were reviewed by initialing the PTO Form 1449.

3. Double Patenting

Claims 1 and 27 of the present application were provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1 and 16 of copending Application No. 10/684,208, (hereinafter referred to as "the '208 application"). Claims 15, 81, and 105-107 of the present application were provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 48, 66, and 51 of the '208 application.

Applicants state that, upon receiving allowable subject matter, they will submit a terminal disclaimer.

4. Rejections based on 35 U.S.C. §§102, 103

Claims 1-5, 8-9; 14-25, 27-38, 46; 50-53; 60-66; 68-72; 74-78; 81-82; 86-90; 94, 96, 98-102; 105-109; and 111-116 were rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent Publication No. 2003/0179891 A1 (Rabinowitz et al). Claims 10-13, 26, 54-56, 58-59; 92-93; 95, 97, and 110 were rejected under 35 U.S.C. §103(a) as being unpatentable over the Rabinowitz reference. Claims 6-7, 31, 39-45, 47-49, and 83-85 were rejected as being unpatentable over the Rabinowitz reference in view of U.S. Patent No. 5,638,343 (Tricknor). Claims 57, 67, 91, 73 were rejected as being unpatentable over the Rabinowitz reference and further in view of U.S. Patent 7,184,556 (Johnson et al.). Claims 79-80, and 103-104 were rejected as being unpatentable over Rabinowitz and further in view of U.S. Patent Publication No. 2003/0058786 A1 (Sato et al.)

One aspect of the invention comprises generating predicted transfer functions at a plurality of listening positions and statistically analyzing the predicted transfer functions at the plurality of listening positions (such as statistically analyzing for flatness across the listening positions). This is significantly different from merely generating/analyzing a single position or an average of a single position, as taught in the Rabinowitz reference. In particular, the Rabinowitz reference teaches an analysis that focuses on a single input. While the Rabinowitz reference discloses taking measurements for multiple listening positions, the Rabinowitz reference teaches that the measurements are simply averaged to generate a single input for the analysis. See paragraph [0031] ("At step 54, the data signals for all the positions may be combined by the acoustic measuring circuitry 19 (by some method such as energy averaging) and an equalization pattern developed from the data signals."). In this way, the Rabinowitz reference fails to teach, or even suggest, generating predicted transfer functions at each of the plurality of listening positions. And, because the Rabinowitz reference only focuses on an average of the seat positions, the Rabinowitz reference is unable to reduce the variance from one listening position to the next. For example, in the event that there is a variation in the loudness from one seat to the next, the Rabinowitz reference cannot select a correction factor that reduces the variation between the seats.

By contrast, the claims recite predicting the transfer functions at at least two of the plurality of listening positions and statistically analyzing the predicted transfer functions at the plurality of positions. See claim 1 ("modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions at each of the plurality of listening positions"); claim 15 ("instructions for modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions at each of the plurality of listening positions"); claim 25 ("the processor . . . modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions at each of the plurality of listening positions"); claim 27 ("modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions at at least two of the plurality of listening positions" and "statistically analyzing the predicted transfer functions at the at least two of the plurality of listening positions") claim 81 ("instructions for modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions at at least two of the plurality of listening positions" and "instructions for statistically

analyzing the predicted transfer functions at the at least two of the plurality of listening positions") claim 105 ("logic for modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions at at least two of the plurality of listening positions" and "logic for statistically analyzing the predicted transfer functions at the at least two of the plurality of listening positions"); claim 106 ("code segment for modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions at at least two of the plurality of listening positions" and "code segment for statistically analyzing the predicted transfer functions at the at least two of the plurality of listening positions"); claim 107 ("means for modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions at at least two of the plurality of listening positions" and "means for statistically analyzing the predicted transfer functions at the at least two of the plurality of listening positions"); claim 111 (processor means . . . for modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions at each of the plurality of listening positions, and for statistically analyzing the predicted transfer functions); claim 114 ("a processor . . . modifying the transfer functions based on the potential configurations in order to generate predicted transfer functions at each of the plurality of listening positions, and statistically analyzing the predicted transfer functions).

Because of the predicting/analyzing of the transfer functions at the plurality of listening positions, present application can select correction factors which improve any characteristic across the different listening positions, such as flatness, consistency, efficiency, smoothness, etc. The Rabinowitz reference is entirely incapable of making such improvements across the listening positions.

For example, claims 117 and 119 recite a methodology by which two different configurations are analyzed. In particular, a statistical analysis of the first configuration is performed by analyzing a criterion (such as flatness) for two predicted transfer functions for the first configuration (one at a first listening position and another at a second listening position). And, a statistical analysis of the second configuration is performed by analyzing the criterion for two predicted transfer functions (again, one at a first listening position and another at a second listening position). The methodology may select from the first or second configuration by

analyzing the criterion. For example, the flatness may be statistically analyzed so that the configuration that has a flatter response may be selected.

The Rabinowitz reference wholly fails to teach or suggest any such analysis across the plurality of seats. As discussed above, the Rabinowitz reference merely averages the responses at the various seats. In this way, the Rabinowitz reference may fail in selecting the better configuration because it does not statistically analyze seat-to-seat. This is easily illustrated by a trivial example of two room responses at two different seats, one which has a large peak at a given frequency and one with a corresponding dip at that frequency. Evaluation of the spatial average (as taught in the Rabinowitz reference) would suggest an optimal and "flat" response had been achieved. Statistical analysis according to the claims as presented would not. In particular, the seat-to-seat statistical analysis as claimed would indicate that the configuration for the predicted transfer functions includes the large peak and the corresponding dip, thereby indicating that the predicted transfer functions (as analyzed for each of the seats) is not particularly flat. For at least this reason, the claims as currently presented distinguish over the cited reference.

The Office Action further rejected claim 6 as being obvious in view of the combination of Rabinowitz and Tricknor. Claim 6 recites "determining potential positions of the loudspeakers" and "generating potential combinations of speakers based on the potential positions of the loudspeakers". See also claim 39. In rejecting claims 6 and 39, the Office Action states the following:

> Tricknor disclose a system for multitrack wherein the parameter comprises loudspeaker locations ("fig.1-2") for the purpose of reproducing the multiple channel of sound. Thus, taking the combined teaching of Rabinowitz and Tricknor as a whole, it would have been obvious for one of ordinary skill in the art to modify the Rabinowitz reference by incorporating the limitation where the parameter comprises loudspeaker locations for the purpose of reproducing the multiple channel of sound.

For convenience, Figures 1 and 2 of the Tricknor reference are reproduced below:

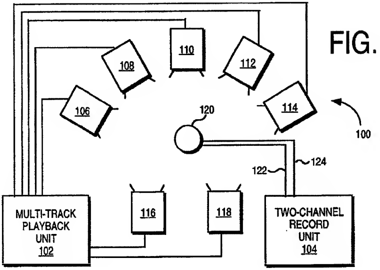


FIG. 1

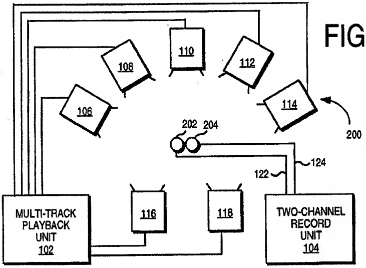


FIG. 2

Applicants respectfully disagree that the Tricknor reference teaches using "potential positions" for the loudspeaker as a parameter for the analysis for several reasons. First, the Tricknor reference teaches that speakers 106-118 are the speaker positions, not a "potential" speaker position. Second, neither the Tricknor reference nor the Rabinowitz reference teach that potential loudspeaker positions may be analyzed (such as generating potential combinations of speakers). Rather, there is only one configuration (which includes each of speakers 106-118). Therefore, in addition to the reasons cited above, the reference clearly fail to teach or even remotely suggest the invention as claimed.

The Office Action further rejected claim 10 as being obvious in view of the Rabinowitz reference. The Office Action acknowledges that the Rabinowitz reference fails to teach the

limitation claimed in claim 10. However, the Office Action takes "Official Notice" "that the limitation of analyzing the plurality of frequencies less than 120 Hz is simply the inventor's preference." Applicants respectfully disagree that analyzing frequencies of less than 120 Hz is merely inventor preference. In support of this, Applicants submit the declaration of both of the inventors. As the inventors' state, one application of the present invention is to generate predicted transfer functions at a plurality of listening positions and statistically analyze the predicted transfer functions at the plurality of listening positions (such as statistically analyzing for flatness across the listening positions in order to select a configuration of the system to improve flatness from seat-to-seat). See Declaration of Inventors, ¶4. Applying this predicting/analyzing methodology is particularly advantageous at lower frequencies, such as at less than 120 Hz. In particular, because the lower frequencies have a longer wavelength, these lower frequencies may be significantly different for a first listener (at a first listening position) than for a second listener (at a second listening position) hears. Reducing the seat-to-seat variation (particularly at the lower frequencies) between the first and second listening position may thus have a significant effect, and is not merely the inventor's preference.

The Office Action further rejected claim 11 as being obvious in view of the Rabinowitz reference. See also claims 54, 55, 56, 58, and 59. The Office Action acknowledges that the Rabinowitz reference fails to teach the limitation claimed in claim 11. However, the Office Action takes "Official Notice" "that the concept of doing statistical analysis from the group consisting of mean spatial variance, mean standard deviation, mean spatial envelope, and mean spatial maximum average is commonly known in the art . . . ." The inventors disagree that using these types of statistical analyses (such as mean spatial variance, mean standard deviation, mean spatial envelope, and mean spatial maximum average) in order to reduce seat-to-seat variation is commonly known. These particular types of statistical analyses provide different insights into the seat-to-seat variation, and therefore provide different ways to examine (and reduce) the seat-to-seat variation. See Declaration of Inventors, ¶5. Further, the Rabinowitz reference, used in the Office Action to reject the claims, supports the notion that these types of analyses (in this context) are not known.

The Office Action further rejected claim 45 as being obvious in view of the Rabinowitz reference. The Office Action acknowledges that the Rabinowitz reference fails to teach the limitation claimed in claim 45. However, the Office Action takes "Official Notice" "that the

limitation of of [sic] the potential types of loudspeakers comprise a dipole loudspeaker and a monopole loudspeaker is commonly known in the art." Applicants respectfully disagree. In support, the inventors state that they disagree that analyzing the potential type of loudspeaker (such as selecting a monopole and dipole loudspeakers) as a parameter to reduce seat-to-seat variation is commonly known. They further state that in an example of a 2-speaker audio system, the methodology may statistically analyze different combinations of the types of speakers (such as monopole-monopole, monopole-dipole, dipole-monopole, and dipole-dipole). Analyzing these various combinations, particularly for different types of speakers (*e.g.*, monopole-dipole), to reduce seat-to-seat variation is not known. See Declaration of Inventors, ¶6.

The Office Action further rejected claim 57 as being obvious in view of the Rabinowitz reference and the Johnson reference. The Office Action acknowledges that the Rabinowitz reference fails to teach a statistical analysis indicating flatness of the predicted transfer functions, instead relying on the Johnson reference, citing figures 1 and 16; col. 13, lines 51-55; col. 16, lines 16-18; col. 20, lines 44-47; and col. 22, lines 51-54. For completeness, the citations are reproduced below:

FIG. 1

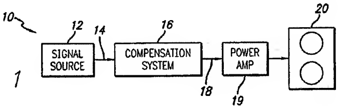
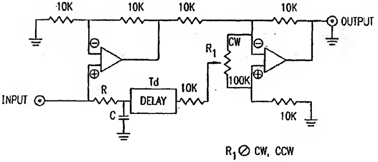


FIG. 16



Physical structures to do this include ports, tubes, passive resonators, labyrinths, other woofers, etc. Much literature has been devoted to modeling and tuning these systems, usually to achieve flattest possible frequency response. [col. 13, lines 51-55]

> The unsymmetrical boost helps flatten the frequency response. Other aspects are the same. [col. 16, lines 16-18]
>
> The compensation system uses slopes, crossovers, and other mathematical functions to create predicted corrections for characteristics of the speaker. These operations are controlled by coefficients or points, and by process commands instead of from documenting and calculating responses to linear plots. Since each process has a specialized nature, the range of frequencies, amplitudes, Qs, etc., confine parameter ranges to small portions of a control space. [col. 20, lines 44-49]
>
> Response ranges for their adjustable parts can be predicted from the conjugate model so that parallel signal paths and multiple shared functions are possible. Much fewer active devices are needed in a signal path, thereby reducing costs and distortion. [col. 22, lines 51-55]

As clearly shown from the excerpts above, the only relation to "flatness" is a compensation system that attempts to flatten the frequency response. There is no discussion, whatsoever, regarding any analysis of predicted transfer functions (or even generating any predicted transfer functions). Applicants respectfully contend that the Johnson reference is merely the result of an electronic search with the keyword "flatness," bearing no other relation or relevance to the invention at hand.

The Office Action further rejected claim 73 as being obvious in view of the Rabinowitz reference and the Johnson reference. The Office Action acknowledges that the Rabinowitz reference and the Johnson reference fail to teach the limitation claimed in claim 67. However, the Office Action takes "Official Notice" "that such limitation of the selecting of the value to increase the output comprise selecting a value that decreases the volume of at least one of the loudspeakers in the audio system is commonly known in the art." Applicants respectfully disagree. In support, the inventors state that they disagree that it is commonly known that decreasing volume of one of the speakers results in an increase in the audio system output. In particular, the inventors completely disagree that it is commonly known to **increase** acoustic efficiency by **decreasing** volume. It is counterintuitive to decrease the volume to increase the acoustic efficiency. See Declaration of Inventors, ¶7. Therefore, applicants respectfully request the rejection be withdrawn.

4. Conclusion

The Examiner is invited to contact the undersigned attorneys for the Applicant via telephone if such communication would expedite this application.

Respectfully submitted,

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